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Noncardiac Operations After Coronary Revascularization

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In 35 patients who had had earlier myocardial revascularization, a total of 44 noncardiac operations under general or spinal anesthesia were carried out. There was one cardiac death and three postoperative complications. Compared with the risk of general anesthesia and noncardiac surgical procedures in patients with coronary artery disease who have not had coronary revascularization, this is a major improvement. We conclude that myocardial revascularization provides significant protection against the risk of cardiac complications and death for patients with ischemic heart disease in whom general anesthesia and noncardiac procedures are needed.

WITH PROGRESSIVELY MORE patients undergoing coronary revascularization, and with the life expectancy of patients with severe ischemic heart disease increased because of coronary revascularization, we are encountering more patients with previous aortocoronary bypass in whom noncardiac operations are needed. Because arteriosclerosis is a generalized cardiovascular disease, it is not surprising that other vascular procedures such as abdominal aortic aneurysms, aortofemoral and carotid procedures constitute a large number of the secondary procedures required. The need for nonvascular abdominal, urological and intrathoracic procedures also is being encountered with increasing frequency in an ever growing population with previous myocardial revascularization. This retrospective analysis was done in an attempt to assess the risk or safety of noncardiac procedures in patients who have had myocardial revascularization.

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Patients

All patients with prior coronary revascularization undergoing noncardiac operations under general or spinal anesthesia at the University of New Mexico Hospital and the Veterans Administration Medical Center in Albuquerque during the period of July 1976 to December 1980 were included. Procedures carried out under local anesthesia and diagnostic procedures were not included. Patients in whom a secondary procedure was done to treat a complication of the cardiac operation in the immediate postoperative period—such as mediastinitis, acute cholecystitis or acute pancreatitis—were also excluded from this review. Thirty-five patients ranging in age from 36 to 70 years (mean 55.9 years) were included. There were 33 men and 2 women. They underwent a total of 44 noncardiac operations (6 patients had more than one secondary operation). Eleven patients had a history of chronic hypertension.

Thirteen patients were more than 60 years of age. Twenty-four patients had significant three-vessel coronary artery disease. The interval from coronary revascularization to secondary operation was six days to 48 months (mean 11.63 months). The myocardial revascularization consisted of one to five vessels (mean 3.05 vessels) aortocoronary bypass. In addition, two patients had aortic valve replacements and two patients had left ventricular aneurysm resections. The 44 secondary procedures in the 35 patients were distributed as shown in Table 1. Four procedures were done under spinal anesthesia and the rest under general anesthesia.

TABLE 1.—*Distribution of 44 Secondary Procedures in 35 Patients Who Had Had Myocardial Revascularization*

Intra-abdominal vascular procedures	11
Intra-abdominal nonvascular procedures	12
Peripheral vascular procedures	10
Others (intrathoracic, urological and surface procedures)	11

Results

There were two deaths related to the operations. One was presumed to be cardiac in origin. In a 49-year-old man a cholecystectomy was carried out for subacute cholecystitis three months after coronary revascularization. Four days postoperatively, during what appeared to be a satisfactory course, he had a cardiac arrest while walking. He could not be resuscitated. At autopsy the aortocoronary grafts were found to be patent and there was no evidence of recent myocardial infarctions or pulmonary emboli. His death was presumed to be secondary to an episode of arrhythmia. The other death was thought to be noncardiac in origin. A 64-year-old woman had an aortic valve replacement and a two-vessel coronary revascularization. She was a patient with steroid-dependent rheumatoid arthritis. Fifteen months after her cardiac operation she underwent a laparotomy with colostomy for a perforated rectum. An intra-abdominal abscess developed and the patient died one week later from sepsis.

Three complications occurred. One pulmonary embolus responded to standard anticoagulant therapy. In one patient supraventricular tachyarrhythmia was controlled with medical therapy and in another a superficial thrombophlebitis developed which responded to standard nonoperative treatment.

Discussion

The high incidence of cardiac complications in patients with ischemic heart disease undergoing surgical procedures under general anesthesia has been documented in several reports. Steen and co-workers[1] reviewing the cases of 587 patients with previous infarctions found an incidence of reinfarction of 6.1 percent with general anesthesia. Sixty-nine percent of these reinfarctions were fatal. Risk factors associated with the highest incidence of reinfarctions were thoracic and upper abdominal procedures, time under anesthesia, hypotensive episodes during operation and preoperative hypertension. Several reports[2-5] reviewing more specifically the results of abdominal aortic aneurysm resections also documented a high incidence of fatal myocardial infarctions in patients with histories of ischemic heart disease. Fatal myocardial infarction was the leading cause of early death in these series. This high incidence of cardiac complications following abdominal aortic aneurysm resections is not surprising because these patients are more likely to have the high risk factors delineated in Steen's report.[1] The incidence of myocardial infarctions with other procedures also remains higher than normal for patients with known coronary artery disease undergoing carotid endarterectomies, aorto-iliac reconstruction for occlusive disease and other procedures.[6,7]

Considering the patient population that forms the basis of this report, a preponderance of men older than 50 years with a large number of heavy smokers and hypertensive patients with known ischemic heart disease, we believe the mortality of one cardiac death in 44 procedures (2.4 percent) and the complication rate of 3 of 44 (6.8 percent) is very encouraging and reflects the protection afforded by their previous coronary revascularization. These findings are not unique. Crawford and co-workers[8] reported a mortality of 1.1 percent in 358 patients undergoing noncardiac procedures after an earlier coronary artery bypass. They noted a higher medical complication rate if the secondary procedure was carried out less than 30 days after coronary artery bypass. They also noted that the long-term survival after carotid endarterectomy was better for those patients with a previous coronary artery bypass than for patients with known coronary artery disease and no prior bypass (88 percent three-year survival

versus 73 percent). Ennix and associates[9] reporting on 1,238 patients seen consecutively between 1967 and 1977 noted a 3 percent mortality in 135 patients undergoing carotid endarterectomy with simultaneous coronary artery bypass or following coronary artery bypass, whereas 18.2 percent (14 of 77 patients) of patients with known coronary artery disease without the benefit of a coronary bypass died following carotid endarterectomy. Mahar and co-workers[7] studying two similar groups of patients reported no postoperative myocardial infarctions or cardiac mortality in 99 patients with previous coronary artery bypass operations. In 49 patients with known coronary artery disease but no prior revascularization, there were three myocardial infarctions and one death from cardiac causes. In the group of patients with three-vessel coronary artery disease without previous coronary artery bypass, the rate of myocardial infarction was approximately 20 percent following general anesthesia. In our group of patients there were 24 patients with severe three-vessel coronary artery disease. There were no documented postoperative infarctions and one cardiac-related death.

Considering this significant reduction of cardiac complication rates and the progressive decline of the incidence of complications following coronary angiography and aortocoronary bypass, some authors have recommended routine coronary angiography in every patient before elective resection of abdominal aortic aneurysm and aorto-iliac reconstruction.[10] Coronary artery bypass was then done as a preparation for noncardiac operations in selected patients and has resulted in a significant reduction of risk. Whether or not this approach is necessary in every patient is not certain. It would seem appropriate in patients with known coronary artery disease (by history or symptoms or abnormal electrocardiogram) and probably appropriate in patients needing abdominal aortic aneurysm resection.

Even though we do not routinely follow this recommendation in asymptomatic patients, a few of our patients were in this category and coronary angiography and coronary artery bypass were done as a preparation for other major elective procedures. One illustrative example is a 64-year-old man who presented with progressive angina after a previous myocardial infarction. On cardiac catheterization he was found to have severe three-vessel disease. An incidental finding of a physical examination done at admission was a rectal mass that proved to be adenocarcinoma. The risk of an abdominoperineal resection in this patient with severe three-vessel coronary artery disease and progressive angina was considered high. Consequently a four-vessel coronary revascularization was carried out as a preparation. Because of the malignant nature of his other lesion we elected to proceed with abdominoperineal resection without much delay. This was done three weeks later without complication. For purely elective procedures, however, we agree with Crawford's recommendation[8] for a three months' delay because in his extensive review he documented a higher incidence of medical complications when the secondary procedure was done after a shorter interval.

In patients with no evidence of ischemic heart disease undergoing carotid endarterectomy, peripheral vascular operations or other surface procedures, the risk is reasonable with proper anesthetic and postoperative management.[11,12] The fact that their long-term survival is improved with the addition of coronary artery bypass[8,12] should probably be taken on its own merit and included in the progressively changing indication for coronary artery bypass but not necessarily as a protective step before a vascular procedure. Patients without evidence of ischemic heart disease needing aorto-iliac reconstruction for occlusive disease probably fall between these two categories and treatment should be determined based on the other risk factors involved.

Noninvasive assessment and stress testing, when possible, may be a reasonable alternative to coronary angiography in patients at risk.[10,13,14] Unfortunately, the inability of some patients to complete adequate exercise testing as well as the false positive and false negative results continue to be a drawback to the noninvasive testing available.

Even with the protection provided by a previous myocardial revascularization the anesthetic management of these patients should follow the same principles as that for patients with ischemic heart disease in general. This is important because some of these patients may have abnormal left ventricular function or less than complete revascularization and because some grafts may have occluded. Adequate preoperative medication, careful intraoperative and postoperative monitoring, smooth induction of anesthesia with avoidance of hypertension as well as hypotension and avoidance of myocardial depressing agents are all very important. Continuous monitoring of

blood pressure using an indwelling intraarterial catheter is recommended in all patients. In patients with a clinical history of congestive heart failure or with evidence of earlier left ventricular dysfunction, the preoperative insertion of a Swan-Ganz catheter for the monitoring of pulmonary artery wedge pressure is also very beneficial. This is also helpful even in patients with normal left ventricles if it is anticipated that the thoracic or abdominal aorta has to be clamped temporarily. In these cases, if the blood pressure or the pulmonary artery wedge pressure rises during temporary occlusion of the aorta, vasodilator therapy using nitroprusside or other appropriate agents should be initiated to decrease the risk of intraoperative imbalance of oxygen supply and demand. In cases in which the need of inotropic support arises during or after operation (decreased cardiac output with adequate filling pressure) the agent that results in the least increase in oxygen demand should be used. Our present drug of choice in these cases in dobutamine hydrochloride because of its low arrhythmogenic and chronotropic effect.

We conclude that coronary revascularization provides significant protection against cardiac complications in patients with ischemic heart disease undergoing noncardiac operations.

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